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THE
ELEVENTH ANNUAL REPORT
OF THE
LIVERPOOL MARINE BIOLOGY COMMITTEE,
AND THEIR
BIOLOGICAL STATION AT PORT ERIN,
(ISLE OF MAN).¹ 1916

BY

W. A. HERDMAN, D.Sc., F.R.S.,
F.L.S., F.R.S.E.,

DERBY PROFESSOR OF NATURAL HISTORY IN UNIVERSITY COLLEGE, LIVERPOOL;
CHAIRMAN OF THE LIVERPOOL MARINE BIOLOGY COMMITTEE,
AND DIRECTOR OF THE PORT ERIN STATION.

[Read, in part, before the Liverpool Biological Society, 10th December, 1897.]



PORT ERIN BIOLOGICAL STATION.

PRICE ONE SHILLING.

PRINTED BY T. DOBB & Co., 229, BROWNLOW HILL, LIVERPOOL.

1898.

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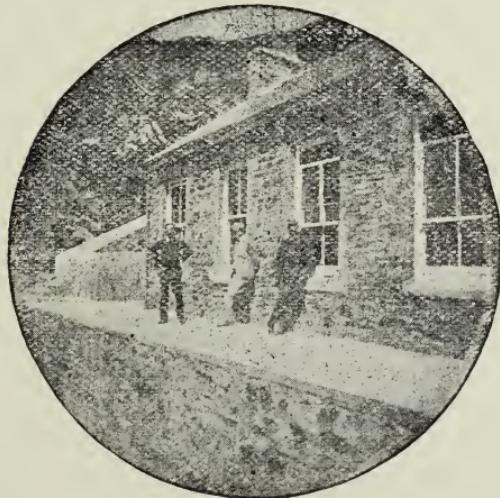
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“Beneath the waves there are many dominions yet to be visited, and kingdoms to be discovered ; and he who venturously brings up from the abyss enough of their inhabitants to display the physiognomy of the country will taste that cup of delight the sweetness of whose draught those only who have made a discovery know.”—

EDWARD FORBES.

ELEVENTH ANNUAL REPORT of the LIVERPOOL MARINE BIOLOGY COMMITTEE and their BIOLOGICAL STATION at PORT ERIN.

By Professor W. A. HERDMAN, D.Sc., F.R.S.

THE past year, though comparatively uneventful, has been marked, as the following pages will show, by much solid biological work carried on at Port Erin and elsewhere on our littoral; and several of our local workers have opened up interesting lines of investigation of both scientific and economic importance. There was experimental fish hatching at Easter, several meetings have been held at Port Erin during the year and lectures and practical demonstrations given, the College tables have been well occupied, some additions have been made to our faunistic lists, and several notable papers published in scientific journals upon the results of work done at the Biological Station.

The fact that we have had fewer dredging expeditions than in some previous years is probably due to the absence of the Hon. Treasurer in Scotland and of the Hon. Director in America during a considerable part of the summer. But the new season will see renewed activity in this direction. Plans are being laid for a more detailed survey of our submarine area, for a systematic exploration of the problems of distribution and environment. The changes of the plankton, or floating life of the sea, a knowledge of which is so important in fishery questions, has already engaged our special attention, and, as will appear further on in this Report, a scheme is in operation for the simultan-

eous observation and record of the organisms on the surface at a number of stations in our district.

It is these general problems, sometimes extending over neighbouring sciences and requiring the co-operation of several specialists, which are now of the greatest interest and practical importance. Our specialists in marine biology are becoming more minute in the details of their work, but, at the same time, wider in their knowledge, in their outlook, and in the applications of their research. Biology—which has given not only to science but to all departments of knowledge the educational method of laboratory work and the great fundamental principle, Evolution, which underlies all advance—is ever ready to adopt methods and results from other sciences as an aid in the investigation of her special problems on land and sea. And in this age, pre-eminently that of Biology—the age of Darwin, Pasteur, and Lister—it is coming to be recognised equally over Europe and America that nowhere more than in Marine Biological Stations has the work of the great masters been followed up and extended, and that nowhere else can be found a more natural and happy union of the philosophy of science and of the industrial applications. It is that that gives to marine laboratories their first-rate importance both in pure science and in the work of Sea-Fisheries Committees, and which is causing universities all over the world to establish and maintain Biological Stations as a necessary condition for the advance of natural knowledge. Thus the University of Paris has Roscoff and Banyuls, Vienna has Trieste, St. Andrew's has just opened the Gatty Marine Laboratory, and Glasgow the Millport Station. We have our modest workshop at Port Erin, and our more extensive Fisheries Institution at Piel, in Lancashire, but we may well hope for and claim a larger and better equipped laboratory at

Port Erin, or at Hilbre, one more worthy of our University and of this great seaport. Liverpool owes much to the sea, it is asking but little that she should take her place in supporting oceanographic research.

STATION RECORD.

The following naturalists have worked at the Port Erin Laboratory during the past year:—

DATE.	NAME.	WORK.
<i>January.</i>	Mr. I. C. Thompson, Liverpool	Collecting.
	Prof. W. A. Herdman, Liverpool	
<i>March.</i>	Mr. H. Murray, Manchester	Algae.
	Prof. F. E. Weiss, Manchester	
<i>April.</i>	Mr. I. C. Thompson, Liverpool	Copepoda.
	Mr. F. W. Gamble, Manchester	
<i>May.</i>	Mr. Cole, Liverpool	Compound
	Prof. W. A. Herdman, Liverpool	
<i>June.</i>	Mr. I. C. Thompson, Liverpool	Copepoda.
	Mr. Cole, Liverpool	
<i>July.</i>	Mr. H. Murray, Manchester	Ascidians.
	Prof. F. E. Weiss, Manchester	
<i>Aug.</i>	Mr. F. W. Gamble, Manchester	General.
	Mr. J. H. Ashworth, Manchester	
<i>Sept.</i>	Mr. Mundy, Manchester	General.
	Mr. Claxton, Liverpool	
<i>Oct.</i>	Mr. Wadsworth, Manchester	General.
	Miss Hiles, Manchester	
<i>Nov.</i>	Miss Pratt, Manchester	General.
	Mr. Jameson, London	
<i>Dec.</i>	Mr. Jackson, Liverpool	Turbellaria.
	Mr. Gunn, Liverpool	
<i>Jan.</i>	Mr. A. Watson, Sheffield	General.
	Dr. Hurst, Dublin	
<i>Feb.</i>	Mr. R. A. Dawson, Preston	Annelids.
	Mr. R. L. Ascroft, Lytham	
<i>Mar.</i>	Mr. F. W. Gamble, Manchester	Annelids.
	Mr. F. W. Gamble, Manchester	
<i>Apr.</i>	Mr. R. H. Yapp, St. John's Coll., Camb.	General.
	Rev. T. S. Lea, Liverpool	
<i>May.</i>	Rev. T. S. Lea, Liverpool	Photography.
	Rev. T. S. Lea, Liverpool	

6 TRANSACTIONS LIVERPOOL BIOLOGICAL SOCIETY.

<i>July.</i>	Prof. W. A. Herdman, Liverpool	...	General.
—	Mr. I. C. Thompson, Liverpool	...	Copepoda.
—	Mr. Cole, Liverpool	...	Ascidians.
—	Mr. R. H. Yapp, Cambridge	...	General.
—	Mr. J. A. Clubb, Liverpool	...	Actinians.
—	Mr. Keeble, Manchester	...	Algae.
—	Mr. Jackson, Liverpool	...	Arachnida.
<i>August.</i>	Mr. Keeble, Manchester	...	Algae.
—	Mr. Jackson, Liverpool	...	Arachnida.
<i>September.</i>	Mr. Keeble, Manchester	...	Algae.
—	Mr. I. C. Thompson, Liverpool	...	Copepoda.
<i>October.</i>	Mr. I. C. Thompson, Liverpool	...	Ascidians.
—	Prof. W. A. Herdman, Liverpool	...	General.
—	Prof. R. Boyce, Liverpool	...	General.
—	Dr. Warrington, Liverpool	...	General.
<i>November.</i>	Prof. W. A. Herdman, Liverpool	...	General.
—	Mr. I. C. Thompson, Liverpool	...	Copepoda.
—	Dr. R. T. Herdman, Edinburgh	...	General.
—	Mr. P. M. C. Kermode, Ramsey	...	General.
—	Mr. R. Okell, Douglas	...	General.
<i>December.</i>	Mr. H. C. Chadwick, Bootle	...	Collecting.
—	Prof. R. J. Harvey Gibson, Liverpool	...	General.

This is about the same total number as in the previous year. We have not this time the distinguished foreign Biologists who visited us after the British Association meeting in Liverpool; but our numbers of students and of ordinary workers are steadily increasing.

Amongst those in the above list are several students from Owens College, Manchester, and University College, Liverpool, who, along with members of the staff of the biological departments, have made use of the work places rented at the Station by the two Colleges. All of the students who took up Zoology as one of the subjects for their final B.Sc. examination in Victoria University, and of whom three passed with Honours, took advantage of the Port Erin Station during some part of their final year of study. During the year the Owens College table has been used by one professor, three demonstrators, two

junior assistants, and three students. The University College table has been used by one professor, two demonstrators, one assistant, one former assistant, and three students.

In addition to workers and students, we had many visitors, and on July 9th, the members of the Isle of Man Natural History Society spent a day at the Station. A public meeting of the Society and others was held in the Laboratory, and your Director gave them an Address upon "The Study of Marine Biology." On that occasion about thirty boys with some of the masters from King William's College, Castletown, also visited the Station, and took a lively interest in the Aquarium tanks and the specimens under microscopes.

Later in July Mr. T. S. Lea, who was working at the time at Port Erin, organised the visit of about thirty Liverpool Board School boys to the Biological Station, along with Mr. H. Edwards, one of their masters. They were taken for a zoological ramble round by Spanish Head and the Calf Sound, came back to Port Erin for tea, and afterwards examined the Aquarium tanks, and were taken to hunt the rock pools at low tide. Nothing is better calculated than marine biology—with its endless variations of form and colour, interesting habits, and instructive adaptations to environment and circumstance—to impress the youthful mind with a love of nature, to encourage powers of observation, to excite curiosity as to the causes of things, and to open up to those accustomed only to a town life some glimpses of the beautiful world of nature.

It has become evident to the Committee that, in the interests of the College students who are now attending the Biological Station, it is necessary to obtain a more highly qualified Curator than the Laboratory lad who has

looked after the place for the last couple of years. They feel also that the presence of a scientific man constantly at Port Erin will result in an improvement in the Aquarium and in the experimental fish hatching. The collecting and recording of specimens and physical observations which has depended so much in the past upon the chance visits of members of the Committee and other investigators ought, under a resident naturalist, to become systematised, and yield valuable results. The Committee consider they are fortunate in having been able to arrange with Mr. H. C. Chadwick—formerly of Owens College, and for some time Assistant Curator in the Bootle Museum—that he shall go into residence at Port Erin at the beginning of the new year, and shall devote his attention, in addition to the routine duties of the post, to a series of observations and investigations upon lines drawn up by the Committee.

It is becoming more evident year by year that both for the purposes of scientific Biology and also in the interests of fishery questions we must endeavour to gain a more intimate and detailed knowledge of the statistics of communities or assemblages of animals on the sea-floor, and of their habits and inter-relations.

A couple of years ago we published* some statistics of dredging on different grounds. This work should be continued and extended. Mr. A. O. Walker has lately† made comparison between the fauna on shallow and that on deep mud, in our area, with the result that the shallow mud shows by far the greater number of genera, species, and specimens of Crustacea. That is a valuable opinion, but refers to one group of organisms only. The individual members of our Committee are specialists—each with his

* Ninth Annual Report, p. 25, 1896.

† Liverpool Biological Society, November, 1897.

own absorbing interest—and though thoroughly alive to the importance of these general questions, they have rarely time or opportunity for sufficiently extended or continuous observations.

In this, as in other departments of work, we hope for much help from our new Curator. Regularity of investigation, observation, and record, and the accumulation of statistics as to modes of occurrence will soon give us a body of evidence from which to draw definite conclusions.

THE AQUARIUM.

Over 350 persons paid for admission to the Aquarium during last summer. The Committee do not consider this a large number. The result of several years' experience is that when naturalists are at the Station—especially responsible members of the Committee—it is easy to attract numbers to a demonstration in the Aquarium. The visitors are interested and anxious to learn when there is anyone to show them what and how to observe, and to explain wherein the importance of the observation lies. In the absence of a scientific zoologist, the Aquarium has languished. Our new Curator will meet this want. He proposes to fill the shelves with collections of local animals, to re-stock the tanks and vessels, to lay out some microscopic preparations, and otherwise to make that part of the institution open to the public more attractive and more efficient.

THE BOAT.

The "Shellbend" folding dinghy, the acquisition of which was recorded in our last Report, has proved a very serviceable boat, and keeps in excellent condition. She holds three comfortably for tow-netting work about the bay, can be expanded for use or folded up again by one

person in about twelve seconds, and is light to carry up and down the shore. We are indebted to Mr. M. Treleaven Reade, of Liverpool, the inventor of the "Shellbend" patent, for the use of the accompanying cuts showing (fig. 1) the bottom of the boat when folded up, and (fig. 2) the interior when half expanded.

THE EASTER PARTY.

Notwithstanding rather boisterous weather the usual L.M.B.C. Easter Dredging Expedition was carried out with success, and the Port Erin Biological Station was never before so full of workers as it was during April. In the actual Easter week the rather limited accommodation was more than fully occupied, and the Committee are in hope that an extension may be provided, which will give several additional working places, before next Easter.

The Colleges of Liverpool and Manchester, it will be remembered, last year acquired the right to send members of their staff or science students to occupy certain work places for specified periods at the Port Erin Laboratory. On this occasion the Owens College was represented by Professor Weiss, Mr. F. W. Gamble, Mr. Ashworth, Mr. H. Murray, Mr. Wadsworth, Mr. Mundy, Miss Hiles, and Miss Pratt; University College, Liverpool, by Professor Herdman, Mr. F. J. Cole, Mr. Jackson, Mr. Claxton, and Mr. W. Gunn. Amongst other workers at the Station were—Mr. Arnold Watson (Sheffield), Mr. Isaac Thompson (Liverpool), Dr. Hurst (Dublin), and Mr. Lyster Jameson (Royal College of Science, London). The Lancashire Sea-Fisheries steamer "John Fell" (with Mr. Dawson, the Superintendent, and Mr. Ascroft, a member of the Fisheries Committee), was at Port Erin during the Easter week carrying on trawling investigations, and several general dredging expeditions were made with her. Spawning-

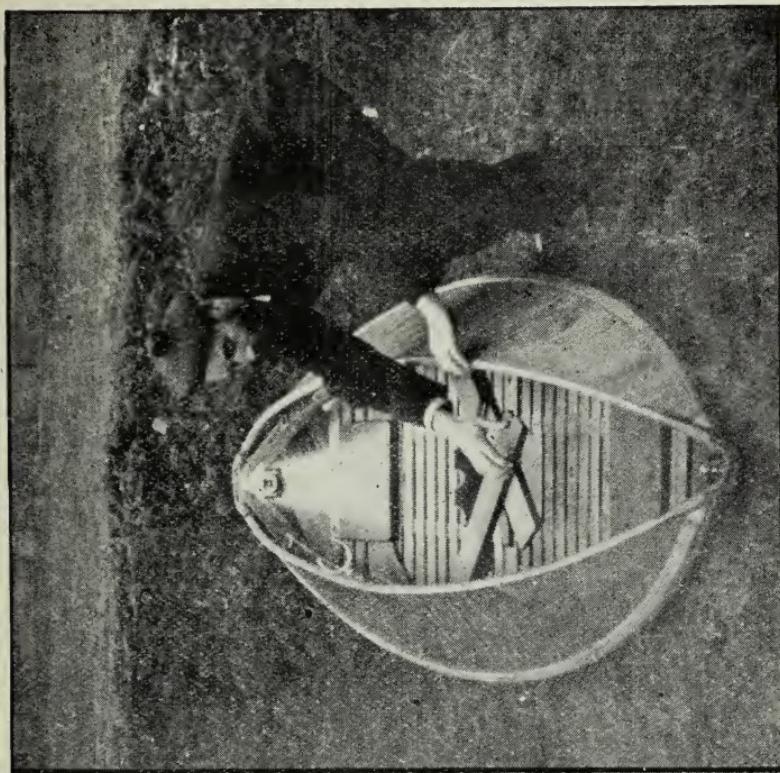


FIG. 1.
10 ft. Shellbend Dinghy.

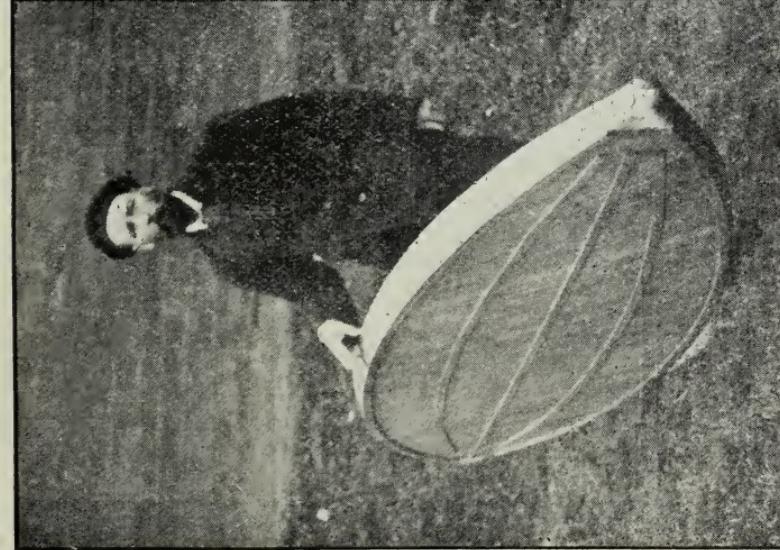


FIG. 2.

ing fish were procured to the west of the Isle of Man, and the tanks in the Biological Station were supplied with developing Lemon Soles and "Witches" (White Soles), and with a cross between the "Megrin" and the Cod. Elsewhere in this Report will be found the accounts given by several of the above-named naturalists of the work which they were engaged in at the Laboratory during the Easter vacation.

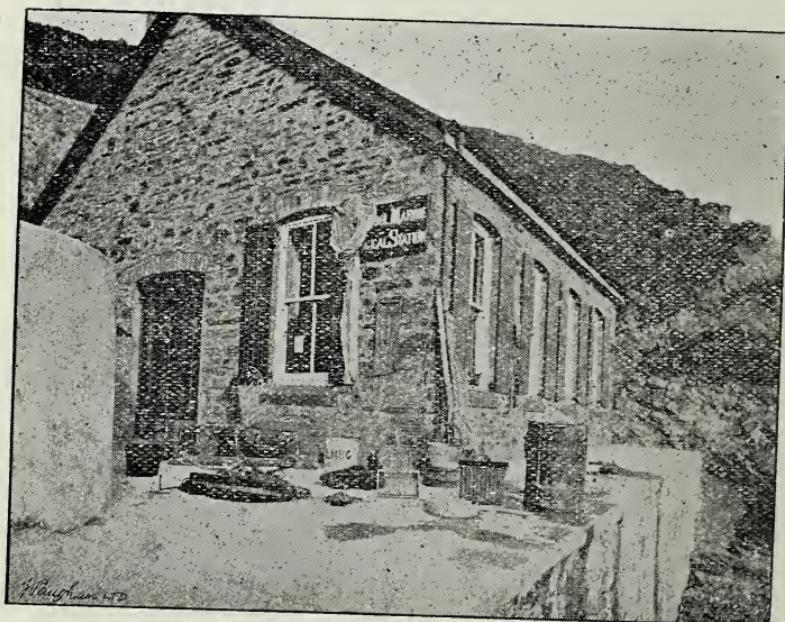


Fig. 3. Eastern half of the Port Erin Biological Station, from the steps, showing the apparatus—trawl, dredges, tow-nets, sieves, aquaria, pails, collecting jars and baskets—brought back from a dredging expedition.

SEA-FISH HATCHING.

In continuation of the experiments carried out at Easter, 1896, last April the Lancashire Sea-Fisheries steamer, "John Fell," came to Port Erin under the direction of Mr. R. A. Dawson, the Superintendent, for the purpose of searching for spawning fish. On Saturday,

April 17th, we trawled mature fish of various kinds both flat and round, but did not succeed in getting both males and females of the same species in the ripe condition, and consequently no eggs were fertilized. On Monday, April 19th, we were more fortunate, and obtained to the northwest of Port Erin Lemon Soles and "Witches" spawning, and were able to fertilize the eggs. We also found spawning Megrims (*Arnoglossus laterna*), and, as an experiment, we fertilized the eggs with the milt of a ripe Cod. As a result large numbers of the following embryos were started on their development in the Aquarium on the afternoon of the 19th:—

- In tank I.—Lemon Soles (*Pleuronectes microcephalus*).
- In tank II.—"Witches" (*Pleuronectes cynoglossus*).
- In tank III.—Ova of Megrim fertilized by milt of Cod.

The arrangement of the hatching tanks, and the apparatus for the circulation of the water was described and illustrated in last year's Report.* The water during the hatching kept at a specific gravity of from .26 to .27 and at a temperature of from 46° to 47° Fahr. The cross between the Megrim (a flat fish) and the Cod only developed for from three to four days, and then all the embryos became abnormal and distorted, and died.

On April 26th the Witches began to move inside the egg covering, on the 27th the Lemon Soles were wriggling, and on the 28th both hatched out, eight and a half days after fertilisation of the eggs.

We have now shown conclusively that sea-fish hatching can be carried on readily at Port Erin, and beyond this experimental stage, dealing with only a few hundreds of eggs at a time, we cannot with our present accommodation and appliances pretend to go. If hatching on an industrial

* See Trans. Biol. Soc., vol XI., p. 67 and Pls. I—IV

scale is to be carried on at Port Erin, it will be necessary to erect a separate building—the hatching house—with an adjacent concreted pond and a boat jetty, alongside the Biological Station. The hatchery house, made two storeys high and placed in the gap to the west of our Aquarium, so that the lower floor would open on the beach and the upper floor from the Aquarium room, could be put up for a comparatively small sum by our local builder at Port Erin. The necessary concreted pond, to be used sometimes for spawning fish and sometimes for rearing young, could be readily made on the beach below, using the cliff as one side, while the opposite wall of the pond could be run out as a boat jetty. Such a hatchery would be available both for sea-fish eggs and also for hatching young lobsters, and its connection with the Biological Station should be an advantage to both institutions, and should especially conduce to the efficiency of the hatchery.

“PLANKTON” OBSERVATIONS.

From an early period in the L.M.B.C. work attention has been directed to the importance of careful observations on the periodic variations in the amount and nature of the plankton or assemblage of drifting organisms on or near the surface of the sea.

In 1888, during our first year of work at Puffin Island, we started our Curator of the Station taking weekly gatherings of surface organisms, which were sent to Liverpool and examined by Mr. Thompson. This was kept up intermittently during the five years of our occupation of the Puffin Island Station. During the first year of the Committee’s work (1885) we noticed (see Report 1, p. 21, and Report 3, p. 8) in some of the gatherings the presence of those extraordinary numbers of *Halosphaera*, *Tetraspora*, and other minute gelatinous

Algæ which periodically cause, round our coast, what has been called "foul water." This was again noticed in 1886, and in subsequent years (Report 3, p. 8). In 1889 (Report 2) we noted the occasional occurrence of phenomenal numbers of *Anomalocera patersonii* over certain tracts of sea, and its subsequent complete disappearance. We also in that year made our first observations upon the effect of "baiting" the tow-net with an electric light, for use after dark both at the surface and at the bottom of the sea (for details see Report 2, p. 17). Further observations of this nature were made in 1889 (Report 3, p. 27), and in the same year's Report we published a summary of the observations throughout the year upon the temperature of the sea and the condition of the organisms upon its surface. A further observation of surface organisms in connection with "foul water" will be found in the next year's Report, for 1890. Other odd notes on the subject occur scattered throughout our ten previous Reports, and in Mr. Thompson's various papers reprinted in the volumes of the "Fauna" (see also "Fauna," vol. I., p. 324, for lists of surface organisms taken at Port Erin in the Summer of 1886).*

Last year we went a step further, and, with the help

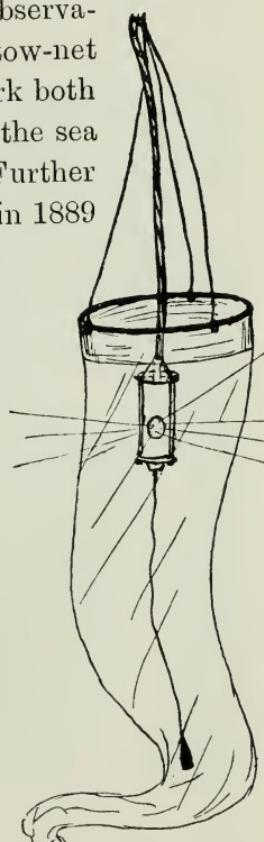


Fig. 4. Tow-net with
electric light.

* Prof. M'Intosh had carried out similar investigations for the Scottish Fishery Board in 1888 (see Seventh Anu. Rep. Fish. Bd., Scot., p. 259, 1889). More recently Messrs. Bourne, Bles, Garstang, and others at Plymouth have recorded the variations in the plankton at different times of the year.

of Mr. Andrew Scott, I organised a scheme for the weekly collection of surface plankton throughout 1897 at six stations in our district. The localities were Port Erin (I. of Man), New Brighton (near Liverpool), Lytham and mouth of Ribble (coast of Lancashire), Piel (Barrow Channel), and from the Fisheries steamer, at sea, wherever she happened to be. The collections were taken, preserved, and sent to my Laboratory at Liverpool, where they were

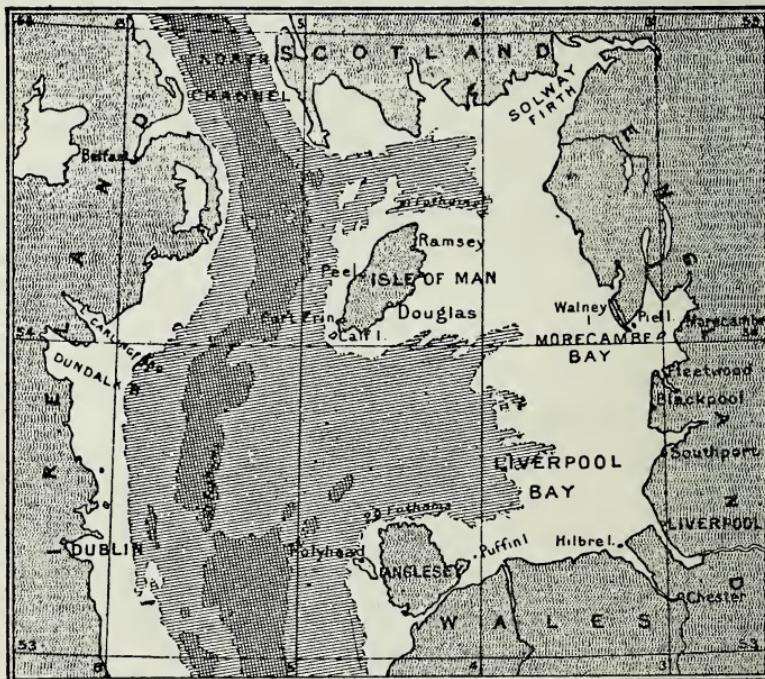


Fig. 5. Plan of the L.M.B.C. District.

measured by Mr. Scott and then examined in detail. The scheme was started towards the end of January, and was kept up as regularly as possible—perfect regularity is not possible, first, on account of the weather, and secondly, because the bailiffs who take the gatherings are liable to be called off occasionally to other duties. During the first fourteen weeks the number of gatherings received

out of the possible six were—5, 6, 4, 3, 4, 2, 3, 4, 4, 3, 3, 5, 3, 4.

These gatherings, which have been worked up fully, bring the record up to the end of April. The rest of the collection, which is now in process of being examined, consists of some sixty tubes, giving an average of nearly two a week for the remainder of the year. The results will be given in the Report on the work of the Sea-Fisheries Laboratory, to be published in a few weeks. Taking these statistics, along with the many previous less complete records that we have, extending back for ten or twelve years, there are some prominent features of the collections taken week by week and month by month that arrest attention—the abundance of *Sagitta* in January and February; the comparative scarcity of Copepoda early in the year; the abundance of diatoms, such as *Biddulphia*, *Coscinodiscus*, *Rhizosolenia*, and *Chaetoceros*, in February and early spring; the appearance of Nauplei and then other larval forms in February and March; the comparative scarcity of plankton all round in February and March (except when gelatinous Algae sometimes swarm in the latter month, and even later); the increase in April, and especially the increased abundance of pelagic Coelenterates and of Copepoda in early summer; the appearance of fish eggs and embryos and larval fish in abundance about Easter; the disappearance of Nauplei and other larvae as summer goes on, and the great increase in Medusæ and Ctenophora; the quantities of *Oikopleura* which appear in the height of the summer; the abundance of Dinoflagellates in late summer and autumn; the great relative abundance of life in general during July, August, and September, and finally the rapid diminution in the amount and variety of plankton during the last few months of the year.

There are, on the other hand, some organisms, such as the Algae *Halosphaera* and *Tetraspora*, the Infusorian *Noctiluca*, and the Copepod *Anomalocera*, which seem to vary greatly in their abundance from year to year; but probably when we have a more complete knowledge of the plankton of the North Atlantic, and of the relations existing between physical conditions and the distribution of organisms, we shall be able to assign rational causes for these curious irregularities in the floating population of our seas.

We have arranged that in 1898 gatherings will be taken weekly at the same six stations, but rather further out at sea, so as to avoid the disturbing influence of the shore.

It is interesting, in this connection, to note that of all the tow-net gatherings which I took this summer in crossing the Atlantic twice, between Liverpool and Quebec, once at the beginning of August, and again at the end of September, those from the sea around Port Erin, between Liverpool bar and the north of Ireland, were the richest in species. The following are the lists of organisms observed in the gatherings in question, quoted from the paper recently published by Herdman, Thompson, and Scott* :—

[OUTWARD JOURNEY—LIVERPOOL to QUEBEC.]

“1. August 5th, 9 p.m., to August 6th, 8 a.m. From 50 miles off Liverpool to about Rathlin Island, Ireland. Water slightly phosphorescent; no *Ceratium* observed; an ordinary Irish sea gathering, containing:—Fish eggs, Gastropod larvæ, *Limacina retroversa*, *Nyctiphantes norvegica* (small), Nauplei, and Zoeas (Crab), Amphipoda (fragments), *Philomedes interpuncta*, *Sagitta bipunctata*, *Mitraria* larva, Medusoids (small), Campanularians

* Trans. L'pool. Biol. Soc., vol. XII., p. 33.

(broken), *Oithona spinifrons* (common), *Calanus finmarchicus* (common), *Paracalanus parvus* (few), *Temora longicornis* (few), *Acartia clausii* (few), *Metridia armata* (rare), *Pseudocalanus elongatus* (few), *Centropages hamatus* (few), *C. typicus* (few), *Anomalocera patersonii* (few), *Longipedia coronata* (rare), *Ectinosoma atlanticum* (rare), *Thalestris serrulata* (rare), *Alteutha interrupta* (rare)."

[RETURN JOURNEY—QUEBEC TO LIVERPOOL.]

"**P**, on bath tap, October 3rd, 5 p.m., to October 4th, 10 a.m. (off Port Erin). *Ceratium tripos*, *C. fusus*, *Peridinium divergens*, *Dictyocysta elegans*, Diatoms, *Globigerina bulloides*, *Calanus finmarchicus* (common), *Centropages hamatus* (few), *Metridia armata* (few), *Pseudocalanus elongatus* (common), *Oithona spinifrons* (few), *Acartia longiremis* (few), *Isias clavipes* (scarce). ?

"**XXI.** and **XXII.** October 3rd, 7 p.m., to October 4th, 9 a.m.; from 20 miles north of Tory Island to 15 miles west of Peel. Great deal of material. Part of it probably from entrance to Lough Foyle, where we stopped for an hour at midnight. Nets at overflow pipe had *Sagitta*, *Medusæ*, *Amphipoda*, and the larger *Copepoda*; nets at tap had much finer stuff—the Protozoa and the smaller *Copepoda*. *Ceratium tripos* (few), *C. fusus* (few), *Navicula* sp., *Dictyocysta elegans*, *Globigerina bulloides*, Unicellular Algae, *Medusæ* (small), *Sagitta* sp. (abundant), *Megalopa*, *Gastrosaccus spinifer*, *Hyperia galba*, *Euthemisto compressa* (common), *Calanus finmarchicus* (common), *Acartia longiremis* (common), *Metridia armata* (common), *Pseudocalanus elongatus* (common), *Centropages hamatus* (few), *C. typicus* (few), *Anomalocera patersonii* (few).

"**XXIII.** October 4th, 9 a.m. to 2 p.m.; from 15 miles west of Peel to near Liverpool Bar. Nets at overflow pipe. *Sagitta bipunctata* (abundant), *Ceratium tripos*

(common), *C. fusus* (common), and *C. furca* (common) *Dictyocha speculum*, *Coscinodiscus radiatus* (common) *Globigerina bulloides* (common), *Biddulphia* sp. (common) *Calanus finmarchicus* (common), *Acartia longiremis* (abundant), *Metridia armata* (few), *Pseudocalanus elongatus* (abundant), *Centropages hamatus* (few), *Isias clavipes* (common), *Parapontella brevicornis* (few), *Labidocera wollastoni* (common).

“**XXIV.** October 4th, same time and locality as **XXIII.** Nets at tap (fine stuff). *Ceratium tripos* (abundant), *C. furca*, and *C. fusus*, *Coscinodiscus radiatus*, *Peridinium divergens*, *Dictyocha speculum*, *Tintinnus acuminatus*, *Codonella campanula*, *Halosphæra viridis*, *Rotalia beccarii*, *Calanus finmarchicus* (common), *Acartia longiremis* (common), *Metridia armata* (few), *Pseudocalanus elongatus* (few), *Temora longicornis* (few), *Centropages typicus* (few), *Labidocera wollastoni* (common), *Oithona spinifrons* (common).”

FAUNISTIC AND OTHER SPECIAL INVESTIGATIONS.

During the year a good deal of collecting has been done on the shores of the south end of the Isle of Man, and the Laboratory Assistant has made many gatherings of Copepoda from the sand and mud at low tide, and has sent them to Mr. Thompson. The tow-net has also occasionally been attached to the buoy at the entrance to Port Erin bay, and left out all night. One such gathering taken in November was sent to Mr. A. O. Walker, and he reports to me that it contained :—

- Siriella armata* (M. Edw.), several young.
- Cuma scorpioides* (Mont.), one only.
- Iphinoe trispinosa* (Goodsir), one only.
- Bathyporeia pelagica*, Bate, one only.
- Apherusa bispinosa* (Bate).

Atylus swammerdamii, M. Edw.

Dexamine spinosa (Mont.).

Mr. I. C. Thompson reports as follows in regard to COPEPODA :—

" During the 'John Fell' expedition of April 19th, a quantity of fish were trawled. A search for fish parasites led to two additions to the L.M.B.C. fauna, viz.: *Trebius caudatus*, Kroyer, and *Caligus diaphanus*, Müller, of which the former were taken in numbers, both males and females, from the Hake, and of the latter a few specimens were found on the Cod.

" On a specimen of *Calanus finmarchicus*, I found the small parasitic Isopod *Microniscus calani*, belonging to the Epicarideæ. Although not infrequently met with on Calani taken in more northern regions where the latter are found in profusion, it appears not to be common about our shores, and has hitherto escaped record in our district.

" W. Bridson, the Laboratory boy, has occasionally, by means of the very convenient "Shellbend" boat, fixed a tow-net to the buoy, near the breakwater, where it has remained all night. Although no forms of Copepoda new to the district have hitherto been met with through this method, the results in material have been such as to warrant our continuing it when practicable throughout the coming year.

" Washings of mud and sand taken at low water from various parts of Port Erin bay, have resulted in our obtaining a large variety of sedentary Copepoda, and among them Mr. A. Scott has recently found some very minute Harpacticidæ of one or more species new to science, but which we are not yet prepared to describe. Some of the rarer sedentary species are occasionally found by this means in very large numbers, as was the case in

October last, when some mud taken near the breakwater was found to swarm with *Laophonte lamellifera*. The rocky pools about Port St. Mary, too, have yielded good results."

Dr. George W. Chaster, of Southport, who has undertaken to report upon the FORAMINIFERA of the district, writes to me:—

"There is one aspect of the work in this group I should like to enter upon. Foraminifera are so enormously abundant, and multiply so rapidly, that they must afford an important food supply to some other animals. I only know of one group of Mollusca—the Scaphopoda—which subsist solely, or almost so, on Foraminifera. There must be many other consumers, and I propose to examine stomachs of various other animals that seem likely. I shall be pleased to examine consignments of stomach-contents which have a gritty feel, if sent to me, with full data. Fish stomachs should yield good results. The reproduction of Foraminifera is also a matter requiring further investigation."

Professors Boyce and Herdman still continue their work on the bacteriology and other diseased conditions of Oysters. In the report of the "Oyster" Committee to the British Association Meeting at Toronto last September, it was shown that there are considerable quantities of copper in certain green leucocytes found in a diseased condition of the American Oyster. The Oysters in this state are always more or less green, and the colour is due to the presence of a compound of copper. The amount of copper is far in excess of what can be accounted for as due to haemocyanin, and it may be explained as due to a disturbed metabolism, whereby the normal copper of the body becomes stored up in certain cells. The cause of this diseased condition is still undetermined.

Mr. F. W. Gamble and Mr. J. H. Ashworth, of Owens College, Manchester, spent three weeks of the Easter vacation, 1897, at the Port Erin Biological Station, working at the anatomy of the species of *Arenicola*, and Mr. Gamble again visited the Station for a few days at Whitsuntide for further research into the same subject. The following is a summary of the results obtained:—

"The shores of Port Erin and Port St. Mary are inhabited by three well-marked species of *Arenicola*, *A. marina*, *A. ecaudata*, and *A. grubii*. The best known of these, *A. marina*, the common 'lug-worm,' is represented on the coarse sandy beaches by the small littoral variety characterised best by the delicate gill plumes being each composed of four or five lateral branches on either side of the main vascular axis, and by constructing U-shaped galleries in the sand. In the gravel and amongst the debris of decomposing rock on the shore of Bay-ny-Carrickey a large, dark variety occurs with gills of the same type, but strongly pigmented. The blood-vessels are very large and turgid. This variety, which may attain a length of one foot, is distinguished by the form of its gills from a somewhat similar, dark, bulky variety, occurring at extreme low water on the Lancashire coast (and known to the fishermen as 'worms,' in contradistinction to the littoral form or 'lugs'), in which the gills have ten or eleven lateral branchlets, and hence a pinnate form. This 'Laminarian' variety has not hitherto been found at Port Erin, but this is probably due to the great depth (up to four feet) to which it is known to burrow.

"The two species *A. grubii* and *A. ecaudata* belong to a division of the genus characterised by the continuation of the gills and parapodia to the hinder end of the body. They are distinguished from one another by important

anatomical peculiarities, which have hitherto escaped notice, with the result that no record of *A. ecaudata*, on British shores, excepting only that made by Dr. G. Johnson, can be accepted as trustworthy. Even the record in the Tenth Annual Report of the L.M.B.C., p. 26, should be *A. grubii*, and not *A. ecaudata*, as printed.

"To establish the differences between these two forms was the chief result obtained by Messrs. Gamble and Ashworth. They have found that *A. ecaudata* has the first gill implanted immediately behind the 16th notopodium on each side, whereas, in *A. grubii*, the first pair of gills occurs behind the 12th notopodia; that the nephridia open on segments 5—17 inclusive, in *A. ecaudata*, while in *A. grubii* there are only five pairs of these organs opening on segments 5—9; that, in the former species, the gonads are massive and compact; in the latter, diffuse and floating freely during maturation.

"The anatomy of Johnston's *A. ecaudata* has hitherto remained unknown. Our researches have shewn it to be by far the most interesting member of the genus, in that it possesses *thirteen* pairs of nephridia, the first of which opens on the 5th chaetigerous segment, and the last on the 17th, or the second of the gill-bearing segments. Hitherto it has been supposed that the six pairs of nephridia of *A. marina* were typical for the genus both in number and in form. It now appears, however, that the nephridia of the true lug-worms are reduced in number, as compared with the similar organs found in *A. ecaudata*, and that the relation of these nephridia to the gonads, is of a more intimate and less transient character than is usually supposed to be the case, and though different in detail, is essentially similar in plan, in these two species. The characters by which *A. ecaudata* may be recognised are—the presence of the first pair of gills

on the 16th chætigerous segment, and of well-marked notopodia on the first segment. The corresponding neuropodia are not closely approximated in the mid-dorsal line.

"The third species of *Arenicola* found in the district occurred along with *A. ecaudata* in fine gravel on the south side of Bay-ny-Carrickey, and also, though not so abundantly, on the south side of Port Erin bay. It is certainly the *A. grubii* of Claparède, which has been hitherto described from Naples, and agrees with his description (incomplete though this is) in all essentials as in the number and position of the gills, the number (five pairs) and relations of the nephridia, and the form of the chætae.

"In our specimens, the first pair of notopodia are absent or extremely reduced, so as to be very rarely visible externally, while the corresponding neuropodia are continued upwards and inwards, so that they almost meet in the median dorsal line. The first pair of gills is attached to the 12th chætigerous segment. Of the five pairs of nephridia, the first opens on the 5th segment (as in *A. ecaudata*), and corresponds in position with the 2nd nephridium of *A. marina*. In addition to these observations (which introduce *A. grubii*, hitherto only known from the Mediterranean, into the British Fauna), some further work was done upon the anatomy of *A. marina*, and the result of this investigation will appear shortly in the 'Quarterly Journal of Microscopical Science.'

"Of these three species, *A. marina* contained little or no traces of reproductive organs. Ripe females of *A. ecaudata* and of *A. grubii* were abundant, though males were scarce and immature (March 26th to April 16th, and the same appeared to hold good at Whitsuntide). It appears that the shore lugs are ripe in the middle of

summer, specimens from Port Erin examined last August proving to be as completely so as the large 'Laminarian worms' were at Blackpool from the end of January to the middle of May. Meanwhile, Mr. Gamble would be very greatly obliged if his fellow workers, during the coming spring, could send to Owens College, Manchester, any specimens of what are suspected to be larvæ or post-larval stages of the common lug-worm, the eggs and development of which are still quite unknown."

Amongst the workers at the Biological Station at Easter was Dr. C. H. Hurst, of Dublin. Dr. Hurst kindly offered to do some work for me, so I suggested that he should make a series of observations and experiments in regard to the currents of water entering and leaving the two apertures of *Polycarpa glomerata*, a gregarious red-coloured simple Ascidian found in great abundance under the limestone masses at Perwick Bay, and clothing the sides of the caves at the sugar-loaf rock. Dr. Hurst has sent me the following account of his results along with some diagrams and an exact record of all his experiments :—

"At the request of Prof. Herdman, I made some simple experiments at the Port Erin Laboratory of the Liverpool Biological Committee, at Easter, 1897, with the object of discovering whether or not the direction of flow into and out of the branchial and atrial cavities of *Polycarpa* was constant.

"To test the direction of the currents, the water in the immediate neighbourhood of the branchial and atrial apertures was made streaky by causing small vortex rings of water-colour paint (lamp black) to pass close to these apertures. This was easily effected by means of a small glass cannula with an india-rubber cap. To eliminate the effect of gravitation, the paint was mixed in the first

instance with sea-water, and fresh-water was then added drop by drop till the specific gravity, as tested by the behaviour of small vortex rings, was identical with that of the sea-water in which the Polycarpæ were living.

"Results:—(1) At the moment of contraction of the body water was driven violently out by the branchial and less violently out by the atrial aperture.

"(2) When undisturbed a slow steady current enters by the branchial aperture.

"(3) When undisturbed the current at the atrial aperture is slow, and is sometimes inwards and sometimes outwards. It was observed to flow thus in opposite directions, while the inward current at the branchial aperture remained constant and steady.

"(4) When a moderately strong mixture of the paint was used, the entrance of it by either aperture was followed (sometimes immediately, but at other times only after a considerable quantity had been inhaled) by sudden contraction of the body and expulsion of water by both apertures, but chiefly by the branchial. In some individuals, at least, this contraction followed more rapidly upon entrance of the paint by the atrial aperture than by the branchial.

"These results would seem to verify the suggestion of Prof. Herdman* that the occurrence of tentacles about the atrial aperture is connected with an occasional inhalation by that aperture, the tentacles serving to detect impurities in the water so inhaled, the stimulation being followed by contraction of the body and expulsion of the impure water."

* British Association Report, Edinburgh, 1892, p. 788; and Bulletin Scientifique de la France et de la Belgique, t. xxv., p. 56, 1893.

Mr. Arnold Watson, of Sheffield, sends me the following report upon his work :—

“ My object in going to the Port Erin Biological Station in April last was chiefly to obtain fresh material for studying the spinning gland of *Panthalis oerstedi*, and so far as the dredging operations were concerned, the object was attained, since we captured the only complete specimen we have ever got, our previous captures being (with the exception of a very young one, which lived in my tank a year) fragments, chiefly the anterior portions, though once a posterior part was taken. The complete specimen above-mentioned was $3\frac{1}{4}$ inches long when at rest. When moving it would be rather longer. I was unable to get it to settle in my tank, though I provided it with mud, &c., and at the end of ten days I killed it, as it was evidently ailing. This specimen was lent to Prof. M'Intosh, who desired to make a drawing from it for his forthcoming Monograph on British Annelids, and he has since returned it.

“ We also got an anterior portion of another *Panthalis*, which lived in my tank until the end of June. It had commenced renewing its hinder quarters, in fact had grown two small anal cirri, when I found it necessary to kill and preserve it. We got a considerable number of mud tubes belonging to *Panthalis*, nearly all of which were empty.

“ I am sorry to say that ill-health has prevented my making use of the material in the way I intended, and so far I have no further progress to report, though I hope in the near future to again take up the study of the spinning gland, and give a further description of *Panthalis* and its mode of working.

“ I think there are only the following two additions to make to your list of species. They are worms which were

dredged up with *Panthalis*, from deep water between Port Erin and Ireland :—*Glycera alba* (Rathke), and *Praxilla gracilis* (Sars). We have previously got them from the *Panthalis* ground, but have not recorded them.

"I got a very fine specimen of *Owenia filiformis* from low water mark opposite Port Erin. I notice that Hornell has not recorded it as found at the Isle of Man, though I was under the impression we have got it by dredging off Bradda Head. I also got *Magelona papillicornis* from low water mark at Port Erin. It also is not recorded in Hornell's list, except in the Lancashire and Cheshire column. So these are additions to the Manx fauna.

"You will be glad to hear that my observations of *Owenia* have been very successful. I have induced the beast to show me his building operations, and by means of experiments, have ascertained how the imbrication of the sand on the tubes is produced. The animal has been good enough to exhibit the action of the labial organ (metastomium), and I have seen it licking the grains of sand, building with them (for which purpose it selects the flat ones), and burrowing or digging down into the sand. That organ is not used for burrowing upwards. The surface of the sand in which the worm lives is reached by a peculiar screwing and undulatory motion of the worm inside its tube. The latter, held by the innumerable uncini, travels with the worm inside it, and is made to stretch until the surface of the sand is reached, though, very occasionally, the hinder part of the tube breaks off (I have only seen this happen once out of a considerable number of trials). It is very much easier for the worm to work its way to the surface than to go down into the sand (if by chance stranded), although, in the first case, the sand on the tube is so arranged as to

cause much more friction, *i.e.*, all the edges of the flat particles are exposed to the sand, but they will, I suppose, act to some extent like the cutting edge of a drill. In going down the worm and tube seem always to travel the other way, so there is less friction, but evidently much more work. I have not yet quite finished my observations."

Professor Weiss and his Museum Assistant, Mr. H. Murray, collected *Algæ* at Port Erin during the Easter vacation. Prof. Weiss gives me the following list of species which have not previously been recorded, and are, therefore, new to the locality :—

Dermocarpa prasina, Born. On *Catenella opuntia* and *Laurencia pinnatifida*.

Spirulina tenuissima, Kütz. Sparingly amongst *Rhizoclonium riparium*.

Rivularia atra, Roth. In shallow pools of fresh water, near high water line, which would be over-run by the sea at high tide.

Rhizoclonium riparium, Harv.

Urospora speciosa, Holm. et Batt.

Enteromorpha ramulosa, Hook.

Ralfsia verrucosa, Aresch.

Callophyllis laciniata, Kütz.

Melobesia corallinæ.

Lithothamnion colliculosum, f. rosea, Fosl. Pt. St. Mary.

Mr. F. W. Keeble, Assistant Lecturer in Botany in the Owens College, Manchester, occupied the Owens College work table during the summer vacation, and was engaged in work on some physiological problems in the nutrition of red sea-weeds. Mr. Keeble reports as follows :—

" During my stay of about two months at Port Erin I was engaged in investigating the significance of the red pigment of the Floridiæ. The research, although incomplete,

seems to point to several interesting conclusions as to the nature of the so-called Floridean starch, the destruction of the red pigment, and the starch-depletion of the cells in intense sunlight. Cases of apparent etiolation-phenomena among the red sea-weeds were recorded, and stages in germination of their spores under various conditions observed."

Prof. Herdman and Mr. F. J. Cole have commenced an investigation on the process of budding and the formation of colonies in various genera of the Compound Ascidians in the hope of being able to throw some light upon the curiously contradictory accounts which have been given by different writers (such as Pizon, Caullery, Ritter, Hjort, and others) of late years, and some of which, if established, would have an important influence on our views as to certain current biological theories. It is also proposed to include in the investigation the comparison and correlation (if any correlation is possible) of the development of the bud with the development of the embryo. Large numbers of colonies have now been collected, preserved, and sectioned at different times of the year from last April onwards. The state of affairs in *Botrylloides rubrum*, and in a species of *Amaroucium*, of which the most complete series have been obtained, will be investigated first.

So far as these observations have yet gone, the process seems to be in agreement with that described by Ritter, and by Lefevre in his recent paper, which has appeared since the present investigation commenced.

Mr. H. Lyster Jameson, B.A., from Dublin, spent two weeks in April at the Laboratory, in work on the TURBELLARIA in continuation of the researches of Mr. F. W. Gamble on that group in a former year. Mr. Jameson gives me the following summary of his results so far:—

"The species recorded are the following, those new to the district being marked with an asterisk(*) :—

"**Polycelis nigra* (O.F.M.) [in fresh-water]; *Aphanastoma diversicolor*, Oe.; *Convoluta paradoxa*, Oe.; *Promesostoma marmoratum* (Schultze); *P. solea* (O. Schm.); **P. agile* (Levinsen); *Byrsophlebs intermedia*, v. Grff.; *Proxenetes flabellifer*, Jensen; **Mesostoma neapolitana*, v. Gr.; *Pseudorhynchus bifidus* (M'Intosh); *Acrorhynchus caledonicus*, Claparéde; *Macrorhynchus nägelii* (Köll.); **M. croceus*, Fab.; *M. heligolandicus*, Metschnikoff; *Provortex balticus* (Schultz); **P. affinis* (Jensen); *Fecampia erythrocephala*, Giard; **Graffilla buccinicola*, n. sp.; **Plagiostoma koreni*, Jensen; *P. vittatum*, Frey and Leuck.; *Vorticeros auriculatum* (O.F.M.); *Cylindrostoma quadrioculatum* (Leuck.); *Monotus fuscus*, Oe.; *M. lineatus* (O.F.M.); *Stylochoplana maculata* (Quatref.); *Leptoplana tremellaris*, O.F.M.; *Cycloporus papillosus*, Lang, var. *lævigatus*, Lang.

"The occurrence of *Mesostoma neapolitana* is of interest, it has hitherto only been found at Plymouth and at Naples. Only the cocoons of *Fecampia erythrocephala* were found. I have since found this worm in more than one locality on the Irish Coast.

"Besides identifying these species I have commented in my report upon certain anatomical characters in various of them, and have recorded one or two interesting varieties. I have also endeavoured to determine the relative abundance of the different species that came under my notice.

"I also describe a new species, which I refer to the genus *Graffilla*, v. Jhering, under the name of *Graffilla buccinicola*. It was found in the kidney of *Buccinum undatum* and *Fusus antiquus*. This species differs from the other members of the genus in the form of the body,

in the form and relations of the gonads, in the position of the reproductive aperture, and in the possession of pigment spots in the superficial parts of the body parenchyma. It comes nearer to *G. muricicola* than to either *G. tethydicola*, v. Graff, or *G. brauni*, Ferdinand Schmidt. *G. mytili* (Levinson) has been described in such a way that its position in the genus cannot be determined until the species is rediscovered. The genus *Graffilla* is a new record for British seas."

Mr. J. A. Clubb, M.Sc. (Vict.), and the Rev. T. S. Lea, M.A., were both at work in different ways on Sea-Anemones during a part of the summer. Mr. Clubb is investigating the animals from an anatomical and histological point of view, dealing with variations in the mesenteries, and studying the structure of the species according to the lines laid down by Prof. Haddon; while Mr. Lea is observing the habits and photographing different conditions and positions—feeding them under the eye of the camera, and taking pictures of them at home in their rock-pools. We shall probably have papers from both these workers, giving their results, at the Biological Society during the winter.

Mr. A. Randall Jackson, B.Sc. (Vict.), spent the Easter vacation at Port Erin, and occupied the University College table in the Laboratory. Besides taking part in the dredging expeditions, in tow-netting on the bay, in general out-door zoology, and in preparing for his Victoria University Examination—which he afterwards passed with first-class Honours—Mr. Jackson commenced to collect and to study the spiders of the neighbourhood. After taking his degree, Mr. Jackson returned to Port Erin for part of the summer vacation, and continued to collect and work out the spiders. He has already identified about forty species of the group, and he proposes to return to the

Laboratory next year and complete a "Report upon the Araneida of the District."

The remarkable new green Gephyrean worm referred to at p. 24 of last year's Report, has since been fully described, discussed, and illustrated, in a recent part of the "Quarterly Journal of Microscopical Science,"* under the name of *Thalassema Lankesteri*. It is in some respects intermediate in its characters between *Hamingia arctica* from Norwegian seas and *Thalassema gigas* from Trieste. It might have been described as a new genus lying between *Hamingia* and *Thalassema*, and forming a term in the series—*Echiurus*, *Thalassema*, the Port Erin form, *Hamingia*, *Bonellia*; but I preferred to enlarge rather the genus *Thalassema* for its reception. The remarkable green colour (which I have called "Thalassemin") has been discussed by Prof. Lankester in a paper in the same number of the Quarterly Journal, and has been contrasted with "Chætopterin," "Bonellin," and some other green tegumentary pigments.

In connection with this new British worm (*Thalassema Lankesteri*), Mr. Lyster Jameson writes to me:—"I have found in the Dublin Museum Collection a specimen of the *T. gigas* group (with two nephridia) from the west coast of Ireland that is probably the same species as your new one. I thought at first it was *T. gigas*, but have recently procured Müller's paper, and find it is quite different. It was taken from the stomach of a Cod during the Dublin Royal Society Survey. There is no trace of green colour, but in a partly digested specimen that may well have gone."

We must endeavour to obtain some more specimens of

* On a new British Echiuroid Gephyrean, with remarks on the genera *Thalassema* and *Hamingia*, by W. A. Herdman, F.R.S.; "Quart. Journ. Mic. Sci.," December, 1897, p. 367 (with two plates).

this interesting form by trawling in the deep channel (see fig. 6) between Port Erin and Ireland.

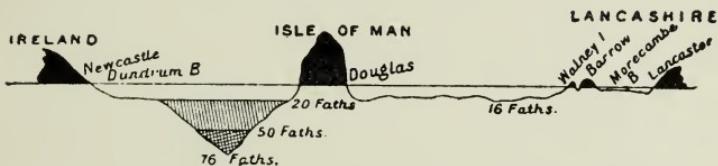


Fig. 6.—Section across the Irish Sea through Douglas.

L.M.B.C. PUBLICATIONS.

Since the last Annual Report the following L.M.B.C. papers have appeared in the Transactions of the Biological Society. As usual, extra copies of the sheets have been struck off and stored for publication in volume V. of the "Fauna," which will probably be ready to be issued in a year or so:—

1. Revised list of Hydromedusæ of the L.M.B.C. district, by Edward T. Browne, B.A., F.Z.S.
2. Additional notes on the Turbellaria of the L.M.B.C. district, by H. Lyster Jameson, B.A.

The following may also be noted under this head:—
(1) In the Sea-Fisheries Laboratory Report for 1896, there have been published some observations on the development of the Gurnard, the Lemon Sole, and the Witch at Port Erin; (2) the Catalogue of the Fisheries Collection, in the Zoological Museum at University College, contains a list of Fishes of the neighbourhood—a group upon which we have not yet had a full report; and (3) Prof. Herdman's paper in the "Quarterly Journal of Microscopical Science" gives an account of the large green *Thalassema* trawled in the deep water off Port Erin.

CONCLUDING REMARKS.

As we have recorded, in the earlier part of this Report, science students from our colleges are beginning to attend the Biological Station for purposes of work. That is very satisfactory; but we shall not be content with science students alone. We desire to interest and educate the general public in Natural History, and to give all university students opportunities of studying living nature. Students of science study, to some slight extent at least, Arts subjects—Literature, History, Languages, and, it may be, Philosophy—but how very few of the ordinary Arts students have even the most elementary acquaintance with any experimental or natural science. Fortunately, it is now becoming rare to hear an educated person boasting of ignorance or indifference to science, but it is still very unusual to find anyone who has received a non-scientific education and who understands and appreciates the natural phenomena by which he is surrounded. The elements of nature-knowledge should surely always form part of a liberal education; and a most instructive portion of the course on nature-knowledge would be a couple of weeks spent amongst the researchers at a biological station. It is a revelation and an inspiration to the young student, or the inexperienced, to spend a forenoon on the rocks exploring and collecting with specialists who can point out at every turn the working of cause and effect, adaptation to environment, and the results of Evolution. It is equally instructive and inspiring to have a day at the microscope with, say, our authority on Copepoda, studying the nature and ways of animals which are probably of greater economic importance to the world than the wheat plains of Manitoba or the gold of Klondike.

Biology is the department of human knowledge which more than any other has been at the foundation of those advances of civilization which are most characteristic of the last half century. It has done much in its applications to lengthen life, to relieve its burdens and ameliorate conditions, to improve, purify, and advance the world. Biological Stations have now been adopted by the universities, they will in time be established also in all sea-port towns as municipal institutions. The great French biologist and educationalist, Paul Bert, has spoken of a similar institution to ours, the Station Zoologique d'Arcachon, as "un établissement d'utilité publique de l'ordre de ceux dont, dans d'autres branches, la création incombe à l'Etat."

Nowhere in all the broad field of knowledge will a man learn better to think exactly than in the natural sciences. Nowhere will he be more impressed with the importance of truth, for truth's sake, than when trained in accurate observation and impartial record at a Biological Station.

Appendices on (A), the Constitution and Regulations of the Committee, and (B), the Hon. Treasurer's Statement and List of Subscribers to the Funds, follow as usual.

APPENDIX A.

THE LIVERPOOL MARINE BIOLOGY
COMMITTEE (1897).

At the meeting of the Committee held in December, 1896, Lord Henniker and Mr. Hoyle were elected in place of Sir Spencer Walpole and Mr. Vicars, resigned.

R. D. DARBISHIRE, Esq., B.A., F.G.S., Manchester.

PROF. R. J. HARVEY GIBSON, M.A., F.L.S., Liverpool.

HIS EXCELLENCY LORD HENNIKER, Governor of the Isle of Man.

PROF. W. A. HERDMAN, D.Sc., F.R.S., F.L.S., Liverpool,
Chairman of the L.M.B.C., and Hon. Director of
the Biological Station.

W. E. HOYLE, Esq., M.A., Manchester.

A. LEICESTER, Esq., formerly of Liverpool.

SIR JAMES POOLE, J.P., Liverpool.

DR. ISAAC ROBERTS, F.R.S., formerly of Liverpool.

I. C. THOMPSON, Esq., F.L.S., Liverpool, Hon. Treasurer.

A. O. WALKER, Esq., F.L.S., J.P., Colwyn Bay.

CONSTITUTION OF THE L.M.B.C.

(Established March, 1885.)

I.—The OBJECT of the L.M.B.C. is to investigate the Marine Fauna and Flora (and any related subjects such as submarine geology and the physical condition of the water) of Liverpool Bay and the neighbouring parts of the Irish Sea; and if practicable to establish and maintain a Biological Station on some convenient part of the coast.

II.—The COMMITTEE shall consist of not more than 12 and not less than 10 members, of whom 3 shall form a quorum; and a meeting shall be called at least once a year for the purpose of arranging the Annual Report, passing the Treasurer's accounts, and transacting any other necessary business.

III.—During the year the AFFAIRS of the Committee shall be conducted by an HON. DIRECTOR, who shall be Chairman of the Committee, and an HON. TREASURER, both of whom shall be appointed at the Annual Meeting and shall be eligible for re-election.

IV.—Any VACANCIES on the Committee, caused by death or resignation, shall be filled by the election, at the Annual Meeting, of those who, by their work on the Marine Biology of the district, or by their sympathy with science, seem best fitted to help in advancing the work of the Committee.

V.—The EXPENSES of the investigations, of the publication of results, and of the maintenance of the Biological Station shall be defrayed by the Committee, who for this purpose shall ask for subscriptions or donations from the public, and for grants from scientific funds.

VI.—The BIOLOGICAL STATION shall be used primarily for the Exploring work of the Committee, and the SPECIMENS collected shall, so far as is necessary, be placed in the first instance at the disposal of the members of the Committee and other specialists who are reporting upon groups of organisms; work places in the Biological Station may, however, be rented by the week, month, or year to students and others, and duplicate specimens which, in the opinion of the Committee, can be spared may be sold to museums and laboratories.

LIVERPOOL MARINE BIOLOGICAL STATION
at PORT ERIN.

REGULATIONS.

I.—This Biological Station is under the control of the Liverpool Marine Biological Committee, the executive of which consists of the Hon. Director (Prof. Herdman, F.R.S.) and the Hon. Treasurer (Mr. I. C. Thompson, F.L.S.).

II.—In the absence of the Director, and of all other members of the Committee, the Station is under the temporary control of the Resident Curator or Laboratory Assistant, who will keep the keys, and will decide, in the event of any difficulty, which places are to be occupied by workers, and how the tanks, boat, collecting apparatus, &c., are to be employed.

III.—The Resident Curator will be ready at all reasonable hours and within reasonable limits to give assistance to workers at the Station, and to do his best to supply them with material for their investigations.

IV.—Visitors will be admitted, on payment of a small specified charge, to see the Aquarium and the Station, so long as it is found not to interfere with the scientific work. Occasional lectures are given by members of the Committee.

V.—Those who are entitled to work in the Station, when there is room, and after formal application to the Director, are:—(1) Annual Subscribers of one guinea or upwards to the funds (each guinea subscribed entitling to the use of a work place for four weeks), and (2) others who are not annual subscribers, but who pay the Treasurer 10s. per week for the accommodation and privileges. Institutions, such as Colleges and Museums, may become

subscribers in order that a work place may be at the disposal of their staff for a certain period annually; a subscription of two guineas will secure a work place for six weeks in the year, a subscription of five guineas for four months, and a subscription of £10 for the whole year.

VI.—Each worker* is entitled to a work place opposite a window in the Laboratory, and may make use of the microscopes, reagents, and other apparatus, and of the boats, dredges, tow-nets, &c., so far as is compatible with the claims of other workers and with the routine work of the Station.

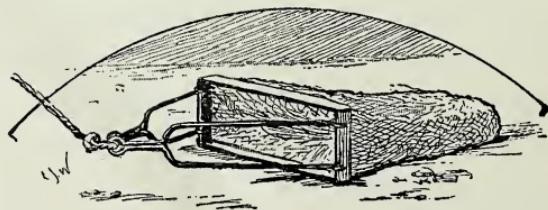
VII.—Each worker will be allowed to use one pint of methylated spirit per week, free. Any further amount required must be paid for. All dishes, jars, bottles, tubes, and other glass may be used freely, but must not be taken away from the Laboratory. Workers desirous of making, preserving, and taking away collections of marine animals and plants, can make special arrangements with the Director or Treasurer in regard to bottles and preservatives. Although workers in the Station are free to make their own collections at Port Erin, it must be clearly understood that (as in other Biological Stations) no specimens must be taken for such purposes from the Laboratory stock, nor from the Aquarium tanks, nor from the steam-boat dredging expeditions, as these specimens are the property of the Committee. The specimens in the Laboratory stock are preserved for sale, the animals in the tanks are for the instruction of visitors to the Aquarium, and as all the expenses of steam-boat dredging expeditions are defrayed by the Committee the specimens obtained on these occasions must be retained by the

* Workers at the Station can always find comfortable and convenient quarters at the closely adjacent Bellevue Hotel; but lodgings can readily be had by those who prefer them.

Committee (*a*) for the use of the specialists working at the Fauna of Liverpool Bay, (*b*) to replenish the tanks, and (*c*) to add to the stock of duplicate animals for sale from the Laboratory.

VIII.—Each worker at the Station is expected to lay a paper on some of his results—or at least a short report upon his work—before the Biological Society of Liverpool during the current or the following session.

IX.—All subscriptions, payments, and other communications relating to finance, should be sent to the Hon. Treasurer, Mr. I. C. Thompson, F.L.S., 53, Croxteth Road, Liverpool. Applications for permission to work at the Station, or for specimens, or any communication in regard to the scientific work should be made to Professor Herdman, F.R.S., University College, Liverpool.



APPENDIX B.

SUBSCRIPTIONS and DONATIONS.

	Subscriptions.	Donations.					
		£	s.	d.	£	s.	d.
Anon. per Prof. Herdman	... ...	—	—	—	1	1	0
Ayre, John W., Rippenden, Halifax	... ...	1	1	0	—	—	—
Banks, Prof. W. Mitchell, 28, Rodney-st.	2 2 0	—	—	—	—	—	—
Bateson, Alfred, Harrop-road Bowdon	1 1 0	—	—	—	—	—	—
Beaumont, W. I., Cambridge	... ...	1	1	0	—	—	—
Bickersteth, Dr., 2, Rodney-st.	... ...	2	2	0	—	—	—
Brown, Prof. J. Campbell, Univ. Coll.	... ...	1	1	0	—	—	—
Browne, Edward T., B.A., 141, Uxbridge-	—	—	—	—	—	—	—
road, Shepherd's Bush, London	... ...	1	1	0	—	—	—
Brunner, Sir J. T., Bart., M.P., Druids	—	—	—	—	—	—	—
Cross	5 0 0	—	—	—	—	—	—
Boyce, Prof., University College	... ...	1	1	0	—	—	—
Caton, Dr., 86, Rodney-street	... ...	—	—	—	1	1	0
Clague, Dr., Castletown, Isle of Man	... ...	1	1	0	—	—	—
Clague, Thomas, Bellevue Hotel, Port Erin	1 1 0	—	—	—	—	—	—
Claxton, E. J.	1 0 0	—	—	—	—	—	—
Comber, Thomas, J.P., Leighton, Parkgate	1 1 0	—	—	—	—	—	—
Crellin, John C., J.P., Ballachurry, An-	—	—	—	—	—	—	—
dreas, Isle of Man	... ... ...	0	10	6	—	—	—
Darbishire, R.D., Victoria-pk., Manchester	1 1 0	—	—	—	—	—	—
Gair, H. W., Smithdown-rd., Wavertree	2 2 0	—	—	—	—	—	—
Gamble, Col. C.B., Windlehurst, St. Helens	2 0 0	—	—	—	—	—	—
Gamble, F.W., Owens College, Manchester	1 1 0	—	—	—	—	—	—
Gaskell, Frank, Woolton Wood	... ...	1	1	0	—	—	—
Gaskell, Holbrook, J.P., Woolton Wood	1 1 0	—	—	—	—	—	—
Gibson, Prof. R. J. Harvey, 5, Adelaide-	—	—	—	—	—	—	—
terrace, Waterloo	... ... ...	1	1	0	—	—	—
	—	—	—	—	—	—	—
Forward ...	£29 10 6	2	2	0	—	—	—

44 TRANSACTIONS LIVERPOOL BIOLOGICAL SOCIETY.

		Subscriptions.	Donations.
		£ s. d.	£ s. d.
	Forward ...	29 10 6	2 2 0
Glynn, Dr., 62, Rodney-street	...	2 2 0	—
Gotch, Prof., Museum, Oxford	...	1 1 0	—
Halls, W. J., 35, Lord-street	...	1 1 0	—
Hanitsch, Dr., Museum, Singapore	...	1 1 0	—
Henderson, W. G., Liverpool Union Bank	1	1 0	—
Herdman, Prof., University College	...	2 2 0	—
Holland, Walter, Mossley Hill-road	...	2 2 0	—
Holt, Alfred, Crofton, Aigburth	...	2 2 0	—
Holt, Mrs. George, Sudley, Mossley Hill	1 0 0	—	—
Hoyle, W. E., Museum, Owens College, Manchester	...	1 1 0	—
Isle of Man Natural History and Anti- quarian Society	...	1 1 0	—
Jameson, H. Lyster, Dublin	...	1 0 0	—
Jones, C.W., J.P., Field House, Wavertree	1 0 0	—	—
Kermode, P. M. C., Hill-side, Ramsey...	1 1 0	—	—
Lea, Rev. T. Simcox, 3, Wellington-fields	1 1 0	—	—
Leicester, Alfred, Buckhurst Farm, Eden- bridge, Kent	...	1 1 0	—
Macfie, Robert, Airds	...	1 0 0	—
Meade-King, H. W., J.P., Sandfield Park	1 1 0	—	—
Meade-King, R. R., 4, Oldhall-street	...	0 10 0	—
Melly, W. R., 90, Chatham-street	...	1 1 0	—
Monks, F. W., Brooklands, Warrington	1 1 0	—	—
Mundy, Randal, Manchester	...	0 10 0	—
Muspratt, E. K., Seaforth Hall	...	5 0 0	—
Newton, John, M.R.C.S., 44, Rodney-st.	0 10 6	—	—
Poole, Sir James, Tower Buildings	...	2 2 0	—
Pratt, Miss, Manchester	...	1 0 0	—
Rathbone, S.G., Croxteth-drive, Sefton-pk.	2 2 0	—	—
Rathbone, Mrs. Theo., Backwood, Neston	1 1 0	—	—
	Forward ...	£67 6 0	2 2 0

		Subscriptions.	Donations.
		£ s. d.	£ s. d.
Forward ...	67 6 0	2 2 0	—
Rathbone, Miss May, Backwood, Neston	1 1 0	—	—
Rathbone, W., Greenbank, Allerton	2 2 0	—	—
Reade, M. T., Blundellsands	... ...	—	3 0 0
Roberts, Isaac, F.R.S., Crowborough	1 1 0	—	—
Simpson, J. Hope, Annandale, Aigburth-dr	1 1 0	—	—
Smith, A. T., junr., 24, King-street	... 1 1 0	—	—
Talbot, Rev. T. U., 4, Osborne-terrace,			
Douglas, Isle of Man	... ...	1 0 0	—
Thompson, Isaac C., 53, Croxteth-road	2 2 0	—	—
Thornely, James, Baycliff, Woolton	1 1 0	—	—
Thornely, The Misses, Baycliff, Woolton	1 1 0	—	—
Toll, J. M., Kirby Park, Kirby	... 1 1 0	—	—
Walker, A. O., Nant-y-glyn, Colwyn Bay	3 3 0	—	—
Walker, Horace, South Lodge, Princes-pk.	1 1 0	—	—
Walters, Rev. Frank, B.A., King William			
College, Isle of Man...	... ...	1 1 0	—
Watson, A. T., Tapton-crescent, Sheffield	1 1 0	—	—
Weiss, Prof. F. E., Owen's College, Man'tr.	1 1 0	—	—
Westminster, Duke of, Eaton Hall	... 5 0 0	—	—
Wiglesworth, Dr., Rainhill	... ...	1 1 0	—
Yapp, R. H., Cambridge...	... ...	0 10 0	—
		—	—
		£93 15 0	5 2 0
		—	—

SUBSCRIPTIONS FOR THE HIRE OF "WORK-TABLES," OCCUPIED
BY COLLEGES, &c.

Owens College, Manchester	...	...	£10 0 0
University College, Liverpool	...	...	10 0 0
			—
			£20 0 0
			—

THE LIVERPOOL MARINE BIOLOGY COMMITTEE.

IN ACCOUNT WITH ISAAC C. THOMPSON, Hon. TREASURER.

Dr.

Dr.

	£ s. d.	£ s. d.
1897.		1897.
To Balance due Treasurer, Dec. 31st, 1896.....	4 10 9	By Subscriptions and Donations actually received.....
Printing Reports.....	16 6 3	" Amount received from Colleges, &c., for hire of
Printing and Stationery	0 12 0	" Work Tables,
Expenses of Dredging Expeditions .....	.35 1 6	" Dividend, British Workman's Public House Co.,
" Boat Hire .....	.2 1 6	" Ltd., Shares
" Books and Apparatus at Port Erin Biological Station	17 2 7	" Sale of Reports and Volumes of Fauna
" Postage, Carriage of Specimens, &c.	1 10 6	" Interest on British Association Fund
" Salaries, Curator and Laboratory Boy	35 1 1	" Bank Interest
" Rent of Port Erin Biological Station	15 0 0	" Admissions to Aquarium
" Repairs.....	0 16 8	" Balance due Treasurer, Dec. 31st, 1897
" Sundries	2 7 2	
	<hr/>	<hr/>
	£130 10 0	£130 10 0
	<hr/>	<hr/>

Endowment Investment Fund :—
British Workmans' Public House Co's. shares £173 1 0

ISAAC C. THOMPSON,
Hon. TREASURER.

Audited and found correct,

A. T. SMITH, JUNR.

Liverpool, December 31st 1897.

L.M.B.C. NOTICES.

The public are admitted by ticket to inspect the Aquarium at suitable hours daily, when the Assistant will be, as far as possible, in attendance to give information. Tickets of admission, price threepence each, to be obtained at the Biological Station or at the Bellevue Hotel. The various tanks are intended to be illustrative of the marine life of the Isle of Man. It is intended also that short lectures on the subject should be given from time to time by Prof. Herdman, or by others of the Committee.

Applications to be allowed to work at the Biological Station, or for specimens (living or preserved) for Museums, Laboratory work, and Aquaria, should be addressed to Professor Herdman, F.R.S., University College, Liverpool.

Subscriptions and donations should be sent to Mr. I. C. Thompson, F.L.S., 53, Croxteth Road, Liverpool.

The surplus copies of the five Annual Reports upon the Marine Biological Station formerly on Puffin Island (1888 to 1892, the complete set) have been collated and bound up to form an 8vo. volume of about 180 pages, illustrated with cuts and plates, and containing the original lithographed covers. There are 20 copies of this vol., which are now offered by the Committee at 3/- each nett.

Copies of the Annual Reports for 1893, 1894, and 1895 can also be had, price one shilling each (all post free).

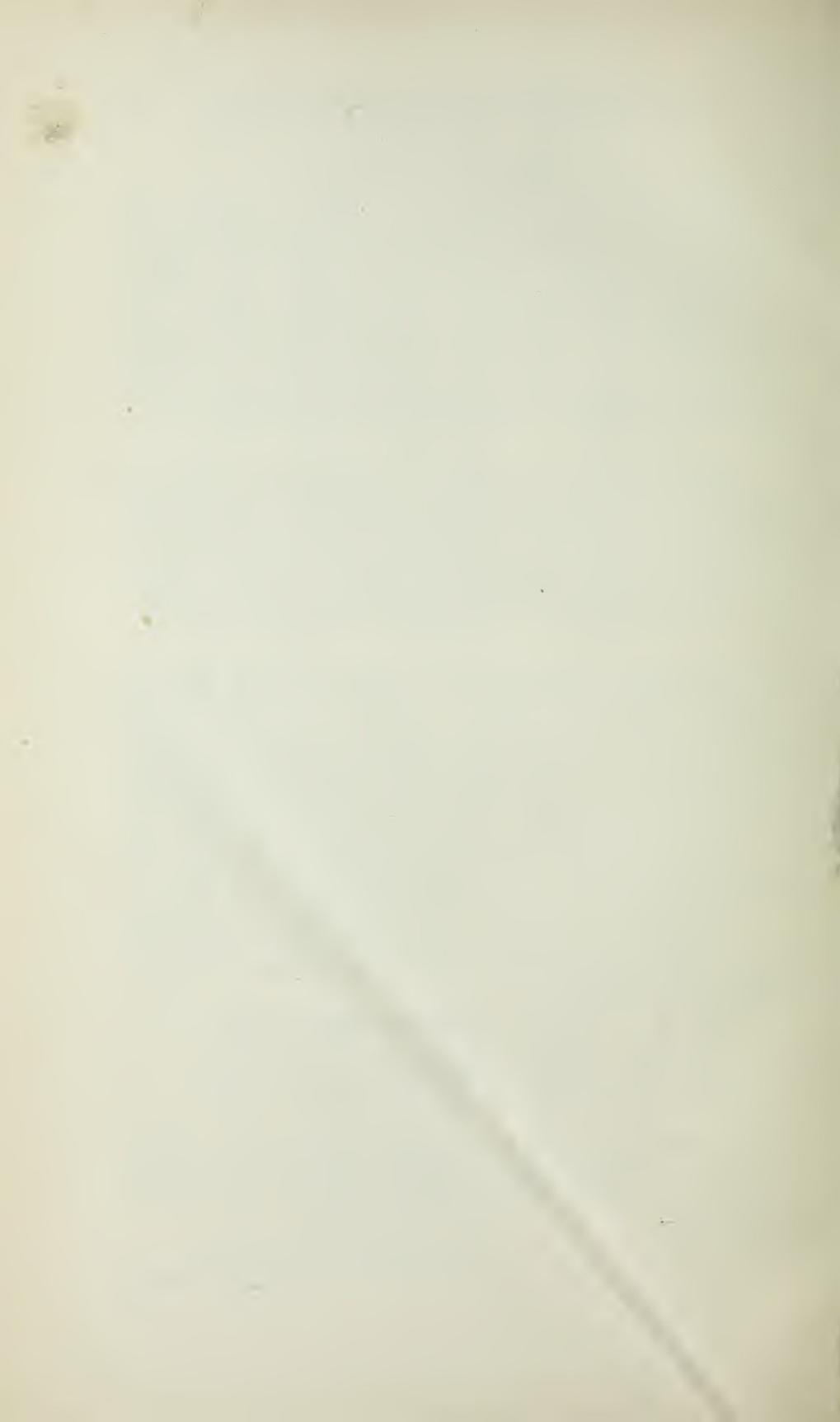
The L.M.B. Committee are publishing their Reports upon the Fauna and Flora of Liverpool Bay in a series of 8vo. volumes at intervals of about three years. Of these there have appeared :—

- Vol. I. (372 pp., 12 plates), 1886, price 8/6.
- Vol. II. (240 pp., 12 plates), 1889, price 7/6.
- Vol. III. (400 pp., 24 plates), 1892, price 10/6.
- Vol. IV. (475 pp., 53 plates), 1895, price 10/6.

Copies of any of the above publications may be ordered from the Liverpool Marine Biology Committee, University College, Liverpool, or from the Hon. Treas., 4, Lord Street, Liverpool.

ISAAC C. THOMPSON,

Hon. Treas.

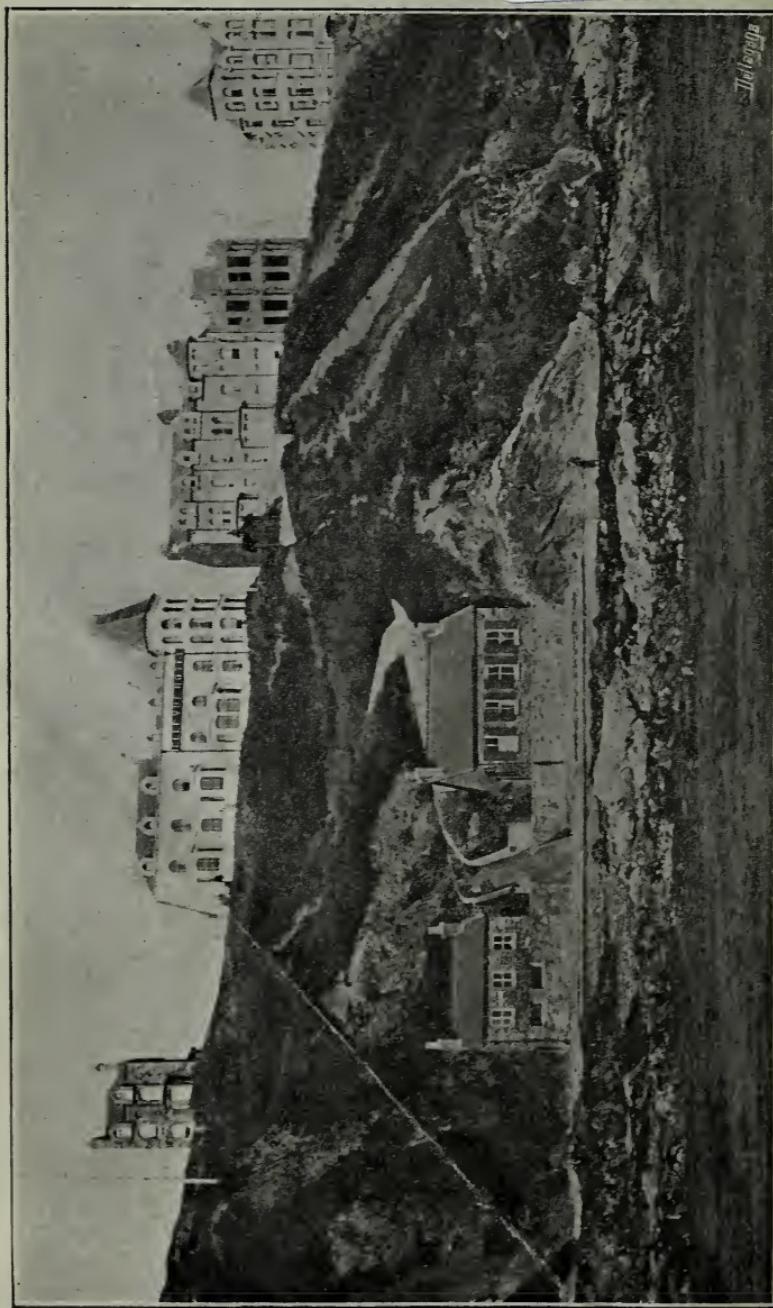




UNIVERSITY OF ILLINOIS-URBANA



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Port Brin Biological Station and its surroundings, at low tide, from the sea.